

## REMARKS

**Claims 1 through 20 were rejected under 35 U.S.C. § 103 for obviousness predicted upon Chen et al. in view of Barth et al.**

In the statement of the rejection the Examiner **inaccurately** asserted that Chen et al. disclose a method comprising treating the upper surface of deposited copper with a plasma while **controlling** conditions to avoid etching the upper surface of porous low-k material. The Examiner then admitted that "...Chen does not teach all the limitations of the claim" (page 3 of the October 7, 2004 Office Action, penultimate paragraph). Unfortunately, the Examiner did not favor the record with what the Examiner views as the limitations Chen et al. fail to disclose, which are **many**. The Examiner then concluded that the claimed invention would have been obvious again making **inaccurate** determinations as to the teachings of Barth et al. The rationale for the Examiner's announced motivation stems from a "therefore" conclusion without the requisite factual basis (paragraph bridging pages 4 and 5 of the October 7, 2004 Office Action). This rejection is traversed as clearly factually and legally erroneous.

### **Insufficient Facts.**

Independent claims 1 and 15 are each directed to a method which comprises a sequence of manipulative steps. These **manipulative steps** include filling an opening with copper (Cu) or a Cu alloy, conducting CMP, and then treating the exposed upper surface of the copper with a plasma. Claim 1 specifies that the manipulative step of "**controlling** plasma conditions to avoid etching the upper surface of the porous low-k material", while claim 15 specifies the low power and low duration of the treating plasma. The Examiner conspicuously failed to identify wherein Chen et al.

even disclose any treatment of planarized Cu in an opening. **Applicants stress the Examiner failed to identify wherein Chen et al. disclose or even suggest plasma treating deposited Cu in an opening formed in a porous low-k material.**

The Examiner says that Chen et al. disclose a method which comprises "... treating the upper surface with a plasma while controlling plasma conditions to avoid etching the upper surface of the porous low-k material at column 5, lines 15-20" (page 2 of the Office Action, third full paragraph). Applicants have reviewed column 5 of Chen et al., lines 13 through 20, and find no such disclosure therein. Applicants have reviewed the entire Chen et al. reference and find no such disclosure therein. The concept of **controlling**, repeat **controlling**, plasma conditions to avoid etching the upper surface of the porous low-k material is not disclosed, suggested or enabled by Chen et al. The **problem** of porous low-k etching during plasma treatment is clearly not even a blip on the radar screen of Chen et al.

The secondary reference to Barth et al. does not cure the argued deficiencies of Chen et al. Barth et al. neither disclose nor suggest the concept of **controlling** plasma conditions while treating the upper surface of inlaid Cu to avoid etching the upper surface of porous low-k material. Indeed, since Chen et al. neither disclose nor suggest the concept of treating inlaid Cu with a plasma to begin with, it matters not one whit what conditions are employed by Barth et al. Furthermore, neither of the applied references discloses or suggests the concept of **controlling** plasma conditions to avoid etching the upper surface of a porous low-k material. In this respect the Examiner's attention is invited to *In re Pinten*, 459 F.2d 1053, 173 USPQ 801 (CCPA 1972).

**There is no motivation.**

In order to establish the requisite realistic motivation, the Examiner must make clear and particular factual findings as to a specific understanding or specific technological principal and then, based upon such factual findings, explain **why** one having ordinary skill in the art would have been realistically impelled to modify particular prior art, in this case the particular method disclosed by Chen et al., to arrive at a claimed invention. *In re Lee*, 237 F.3d 1338, 61 USPQ2d 1430 (Fed. Cir. 2002); *Ecolchem Inc. v. Southern California Edison, Co.* 227 F.3d 1361, 56 USPQ2d 1065 (Fed. Cir. 2000); *In re Kotzab*, 217 F.3d 1365, 55 USPQ 1313 (Fed. Cir. 2000); *In re Dembiczak*, 175 F.3d 994, 50 USPQ2d 1614 (Fed. Cir. 1999). That burden has not been discharged.

As previously pointed out, the primary reference to Chen et al. neither discloses nor suggests plasma treating the upper surface of inlaid Cu. Accordingly, it matters not one whit what conditions are employed by Barth et al. Furthermore, the Examiner refers to column 10 of Barth et al., lines 14 through 29, asserting the disclosure of treating the upper surface of inlaid Cu. However, the section of Barth et al. referred to by the Examiner relates to depositing a capping layer, another manipulative step which Chen et al. neither disclose nor suggest. It should, therefore, be apparent that the Examiner did not establish the requisite fact-based realistic motivation.

**Evidence of nonobviousness.**

It is well settled that the problem addressed and solved by a claimed invention must be given consideration in resolving the ultimate legal conclusion of obviousness under 35 U.S.C. § 103. *North American Vaccine, Inc. v. American Cyanamid Co.*, 7 F.3d 1571, 28 USPQ2d 1333 (Fed. Cir. 1993) *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 15 USPQ2d 1321 (Fed. Cir. 1990); *In re Newell*, 891 F.2d 899, 13 USPQ2d 1248 (Fed. Cir. 1989); *In re Nomiya*, 509 F.2d 566, 184

*USPQ 607 (CCPA 1975)*. The present invention addresses and solves the problem of porous low-k degradation upon plasma treatment of inlaid Cu. Each of the applied references is completely oblivious to that problem. Under such circumstances, the Examiner must consider the problem addressed and solved by the claimed invention as an indicium of **nonobviousness**.

### Conclusion

Based upon the foregoing it should be apparent that a *prima facie* basis to deny patentability to the claimed invention under 35 U.S.C. § 103 has not been established for lack of the requisite factual basis and want of the requisite realistic motivation. Moreover, upon giving due consideration to the **problem** addressed and solved by the claimed invention, the conclusion appears inescapable that one having ordinary skill in the art would **not** have found the claimed invention **as a whole** obvious within the meaning of 35 U.S.C. § 103. *Jones v. Hardy*, 727 F.2d 1524, 220 USPQ 1021 (Fed. Cir. 1984).

Applicants, therefore, submit that the imposed rejection of claims 1 through 20 under 35 U.S.C. § 103 for obviousness predicated upon Chen et al. in view of Barth et al. is not factually or legally viable and, hence, solicit withdrawal thereof.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Application No.: 10/774,418

Respectfully submitted,

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A handwritten signature in black ink, appearing to read "A. J. Steiner", is written over the printed name.

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